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Social Feasibility Assessment for Establishing Habitat Areas Using Built Structures in Austin, Texas

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Social Feasibility Assessment for Establishing Habitat Areas Using Built Structures in Austin, Texas

by

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Thesis

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Abstract

Social Feasibility Assessment for Establishing Habitat Areas Using Built Structures in Austin, Texas

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This thesis is as social feasibility assessment for establishing habitat areas using parking garages in Austin, Texas. The research does not propose a design solution, but seeks to understand key stakeholder perceptions towards the establishment of habitat areas. A constructivist epistemological approach is the foundational framework for this research, supported by literature in regenerative architecture, civic environmentalism, and urban ecology. Through interviewing multiple stakeholders on the goals, opportunities, barriers, and benefits for using built structures as habitat areas, as well as researching local governance and costs structures, the social feasibility is uncovered. In the interview process respondents brought up themes, which are categorized into two broad groups, noted as habitat and social characteristics. Species mentioned by respondents are combined within the habitat characteristics category, and the topics primarily focus on functionally suitable systems for Austin's current, and future climate scenarios. Within the social category, the need for increased public education on the

opportunities and benefits for establishing habitat areas, better coordination among habitat focused groups, and increased municipal financial supports, are the primary subjects discussed. Overall, the conclusion of this research outlines potential future research opportunities to further understand the social feasibility for establishing habitat areas, using built structures, in Austin, Texas.

Key Terms: social feasibility, habitat and built structures, constructivism, habitat in Austin, Texas

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INTRODUCTION

Chapter 1: Problem Statement and Research Question

With the majority of the world's population residing in cities[1], it becomes critical to understand the interactions people have with their built environment. This research focuses on one urban area, Austin, Texas, and aims to understand the feasibly, based on social understandings, for establishing habitat areas using built structures, and parking garages. Typical development patterns often render functional landscapes as ecologically dysfunctional concrete expanses. When trying to re-functionalize these areas, problems arise with balancing already limited urban space among people, structures, and biotic systems. For many urban localities, converting already developed areas to green space can be unrealistic. In envisioning urban environments interfaced with ecosystem functions, opportunities arise in reconceiving the role built structures play.

Reframing buildings as spaces capable of providing ecosystem services, in addition to human habitation, casts structures as spaces able to perform multiple functions. From this purview, buildings might serve as regenerative links in urban ecosystems, creating additive ecological and social benefits. In re-conceptualizing the function structures can provide, more is required than implementing alternative design

[1] Grimm, N. B., Faeth, S. H., Golubiewski, N. E., Redman, C. L., Wu, J., Bai, X., & Briggs, J. M. (2008). Global Change and the Ecology of Cities. Science, 319(5864), 756-760. doi:10.1126/science.1150195

strategies. It requires a change in the perceptions, and expectations people have of their built environment.

People are key stakeholders in the urban environment, and it is imperative to understand their constructed realities towards incorporating habitats onto built structures prior to its implementation[2]. By understanding the current state of perceptions, directions on how to develop built urban systems that mimic ecosystem functions, can better be devised. My research design aims to understand the constructed realities of stakeholders in Austin, Texas, for using the exterior of buildings for habitat establishment[3].

This study will not be proposing a design solution, but will be a social feasibility assessment to gauge the possibility for such developments. My question, as well as other sub-questions are: What are the opportunities for using buildings to serve as biotic habitat locations? What are the socially constructed barriers, and opportunities for developing such systems? What are important habitat characteristics? How is the governance system in Austin affecting habitat development? How does the public perceive the relationship among green space, habitat, and the urban area?

[2] 'Key stakeholders' are individuals with regulatory, or professional expertise in habitat development; or individuals with ownership/management authority over built structures discussed in this research. Stakeholders, and key stakeholders are synonymous

[3] The 'built environment' consists of human engineered structures, landscapes, and systems. Structures, built structures, and the built environment are used interchangeably

LITERATURE REVIEW

The literature topics focused on in this research are urban ecology, civic environmentalism, and regenerative design. Below is an introduction into each topic, followed by a section linking this research with the literature.

URBAN ECOLOGY

Research in ecology has traditionally focused on areas with minimal human impact. Ecosystem and evolutionary dynamics were thought to stem from non-human influences, and people were largely excluded as participants within systems research (Alberti, M. et al., 2003). However, The measurable effects people have in the evolutionary and functional processes of near every ecosystem has led to new frameworks, inclusive of peoples' influence in ecosystem dynamics (Mcintyre, N. E., et al, 2000). Urban ecology focuses on human dominated systems to better understand the ecological and social forces driving, and being driven by, human and non-human stimuli (Grimm, N. B., 2008).

Traditional ecosystem theory is based on an equilibrium philosophy. Ecological research primarily investigated the, "biophysical, ecological, and evolutionary processes unaffected by human influences (Alberti, M. et al., 2003)." These systems were considered closed, self-regulating, and maturing into states of equilibrium (Alberti, M. et al., 2003). People were thought of as agents of perturbation, acting exogenously on systems (Mcintyre, N. E., et al, 2000). However, the rapid proliferation of humans, and our technologies, is effecting near, if not every ecosystem on the planet (Vitousek, et al.,

1997; Mcintyre, N. E., et al, 2000). This has lead to a re-evaluation of the relationship people have to the biophysical environment, and to broader evolutionary processes.

"The 'new ecology' accents disequilibria, instability, and even chaotic fluctuations in biophysical environments, both 'natural' and human-impacted (Steiner, F., 2004)." The 'new' approach to ecology maintains a systems purview, but considers social-political drivers as neither independent, nor exogenous to ecosystem dynamics (Steiner, F., 2004). Ecosystems are viewed as "social-ecological" systems that cover a broad spectrum of spatial and temporal scales, and cannot be understood without considering the, "scales above or below it (Walker, B., et al., 2006)."

Human dominated systems are a core aspect within the urban ecological framework. "Urban ecosystems" are different from other human dominated system, though they include this characteristic, due to the process of "urbanization" as "an ecological and a social phenomenon," creating novel systems. Due to the biophysical changes resulting from anthropogenic factors, human dominated systems represent virtually every ecosystem. Urban ecosystems, however, differ through novel species configurations, and the degree to which social factors, "can be used to explain urban structure and predict trajectories of urban growth." In this way 'urban' is not a strict, but a "working definition" that can vary depending on a research endeavor (Mcintyre, N. E., et al, 2000).

With ecological research beginning to include humans as driving agents, the evolutionary feedback between human and non-human systems has become apparent.

"Human-driven micro evolutionary processes," are being observed in human dominated environments on relatively short temporal scales. These evolutionary changes alter ecological interactions, "creating eco-evolutionary feedbacks (Alberti, M., 2015)." Humans are primary drivers of micro-evolutionary change, and with the rapid development of cities globally, there is significant potential for unprecedented human-driven eco-evolutionary feedbacks.

The field of ecology has progressed beyond an equilibrium approach to ecosystems research. Rather than humans being conceived of as external disruptors, urban ecology analyzes their influential, and integral relationship in ecosystem studies. This field focuses on human dominated systems, and incorporates the effects of social influences into research. Human practices are not only creating novel systems, but are building feedbacks into micro-evolutionary processes happening on short temporal scales.

CIVIC ENVIRONMENTALISM

Environmentalism has developed through various stages and frameworks, depending on the scale at which tactics are devised. At the national scale, "interested-group governance," and "rational governance," are dominant structures. At what John DeWitt calls, "place-by-place" governance, "populist" and "civic" systems are preferred (DeWitt, J., 2004). Tactics have also progressed from "information deficit models," to those focusing on "deliberative and inclusionary processes and procedures," or "DIPS (Angus, B., & Agyeman, J., 2003)."

Information deficit approaches are based on the transfer of information in hopes of increasing peoples' "environmental values," or "pro-environmental behavior (Kollmuss, A. & Agyeman, J., 2002)". This approach is criticized as "largely still failing" to create the "transformative" "paradigm" shifts, in individuals and institutions, needed to move towards a system inclusive of environmental, social, and economic concerns (Angus B., & Agyeman J., 2003). The "production," and "consumption" of knowledge by the public, predominantly has not coincided with their "activism" as "change agents" in the public arena (Angus B., & Agyeman, J., 2003). New approaches, grounded in civic environmentalism, have sought to empower and activate local individuals through, "collaborative decision making, to generate innovative, non-regulatory decisions to a host of environmental problems (Angus, B., & Agyeman, J., 2003).

Civic environmentalism focuses on increasing participatory democracy within the local arena. "Centralized command-and-control" approaches are often too "rigid, inefficient," "reactive," and "inhibiting [of] creative problem solving and holistic environmental management (Gunning, P.M.,1992)." Civic environmentalism is a bottom-up-approach seeking to engage citizens in the "politics of restoration" (Light, A. & Higgs, E., 1996). "Strengthening of the civic commons," is seen as an integral attribute for protecting the "environmental commons." Through engaging citizens in environmental causes, more able methods for addressing interrelated ecological, social, and economic issues, are thought to exist. In this way civic environmentalism aims to nurture a democratic process that, "validates the expertise of not only the professionals

but ordinary people (Reid, H., & Taylor, B., 2003).” The value of activating civic involvement has shown to be a useful, but does come with limitations.

Empowering citizens to address environmental woes does not guarantee environmental responsibility. Galvanizing Americans, “who are first and foremost socialized into the role of consumer rather than citizen,” has the potential to expand the power of corporate titans rather than limit it (Frank, F., 2002). Civic environmentalism’s strength can also be seen as its weakness.

> Civically minded citizens are still individuals with particular religious beliefs and ethical values, people with their own psychological dispositions and preferences, their own family and ethnic traditions, their own class aspirations, and their own particular perspectives on the beliefs, technologies, and economic pressures of the broader society. None of this is in principle erased by the emergence of healthy democratic communities (King, R. J., 2006).

Trans-community, or transnational environmental problems pose as another potential limit to local democratic problem solving. “The protection of wilderness areas, oceans, or the ozone layer,” can seem disconnected from local concerns (King, R. J., 2006). “Decentralization only works if the recipients of authority subscribe to ecological values (Dryzek, J. S., 2000).”

Civic environmentalism does not present a ‘cure all’ to environmentally responsible governance. It is an additional bottom-up approach in environmentalism’s effort to influence “dysfunctional” value systems, inconsiderate of “nature’s intrinsic value” to society (King, R. J., 2006). It is a supplement to federal and state initiatives, which can provide, “information, technical expertise, financial support, and a general

framework of environmental rules and regulations (Gunning, P. M., 1992).” The civic environmentalism approach offers an opportunity to nurture the “responsibility,” and “agency,” of individuals in environmental governance (Agyeman, J., & Angus, B., 2003).

REGENERATIVE DESIGN

As environmental crises continue to develop, the frameworks for addressing such issues continually evolve. As it pertains to the building trade, three paradigms of sustainability-green design, sustainable design, and regenerative design, provide the epistemic history of sustainability’s development. At its onset, the sustainability dialogue has been approached from an anthropocentric purview, and nature as, “a machine that can be understood by reducing it to its parts (Plessis, C. D., 2012).” This approach is fairly technologically deterministic in its perception of nature, in that it assumes “technology and science” can be used to control the limits imposed by natural systems (Plessis, C. D., 2012). "Green design” has been a product of this theory, which focuses on reducing waste and consumption in building practices. It can be summarized as, “doing less harm, or reducing the degenerative consequences of human activity on the health and integrity of ecological systems (Cole, R. J., 2012).”

Out of ‘green design’ grew a more human imbedded ‘sustainable design’ approach. Sustainability re-framed humans as entrenched within ecological systems, and assumed an “optimal, sustainable end state” among human actions and ecological processes. This framework approached buildings as artifacts, which alone are not able to be sustainable, but rather could contribute to “sustainable patterns of living.”

Sustainable design implements a contextually dependent purview, which focuses on a building's contribution to the social, ecological, and economic health of its environment (Cole, R. J., 2012).

The next evolution in sustainability theory began to rectify the position of an 'optimal end state.' Research by individuals, such as Maria Alberti, began to show ecosystems as highly dynamic, fluctuating, and responding to both external and internal perturbations. This change from an 'optimal end state,' to a 'highly dynamic' framework, maintains a systems purview, but one that "accept[s] the inevitability of change (Plessis, C. D., & Cole, R. J., 2011)." "Resiliency" and "adaptation" are terms that begin to frame the dialogue around the new theory of sustainable design (Plessis, C. D., 2012). Rather than working to achieve a state of equilibrium in highly dynamic systems, sustainability began to focus on practices that would beneficially contribute to socio-ecological systems.

Regenerative design is the most recent iteration of sustainability theory, incorporating both green and sustainable design principles. It is a design process that engages and focuses on, "the evolution of the whole of the system in which we are part (Reed, B., 2007)." It's a place-based approach that seeks to understand, and influence the social, ecological, and economic systems, so that development "becomes a source of ecological health (Haggard, B., et al.)." From this purview development embraces nature, and seeks to coevolve with it (Cole, R. J., 2012). Rather than working to maintain a homeostatic state as with sustainable design, regenerative design aims to build

systems that contribute to the overall health of an ecosystem (McDonough, W., & Braungart, M., 2002). As 'green design' focused on "doing less harm," regenerative design reframes building as having, "the capacity to build natural and social capital (Cole, R. J., et al., 2012)."

Sustainability theory is a continually developing process, evolving to address the ecological, social, and economic problems facing society. In the built environment, 'green design' laid the foundation for sustainable, and regenerative design concepts to emerge. Regenerative design, the latest iteration of sustainability theory, is a placed based systems approach, which reconceives development as a potential source of ecological and social health, rather than of degradation.

TYING THE RESEARCH WITH THE LITERATURE

Each subject covered in the literature review, urban ecology, civic environmentalism, and regenerative design, are frameworks in support of one another. Urban ecology's novel approach to urban systems, as dynamic and fluctuating, supports regenerative design's aims at creating resilient, adaptive developments, which beneficially contribute to the local ecological, and social fabrics of a place. Creating social, community capital, is a grounding characteristic of all three-topic areas, and the basis of civic environmentalism's philosophy for solving environmental issues.

This research falls within each theoretical framework by being a social feasibility assessment for developing regenerative systems in the urban environment. Aiming to understand stakeholder perceptions for developing habitat areas, prior to the design-

development of a project, is a chance to gain insight into the social framework of a place. Essentially, this process acts as the primary step for furthering regenerative systems based off local contextual understandings. Using built systems to develop biotic habitat areas embodies the concepts of regenerative design by using development to contribute to the ecological, and social health of a place. Urban ecology is a grounding theoretical understanding in this research, which recognizes the urban environment as a novel, dynamic, and fluctuating ecological system.

Chapter 2: Research Design

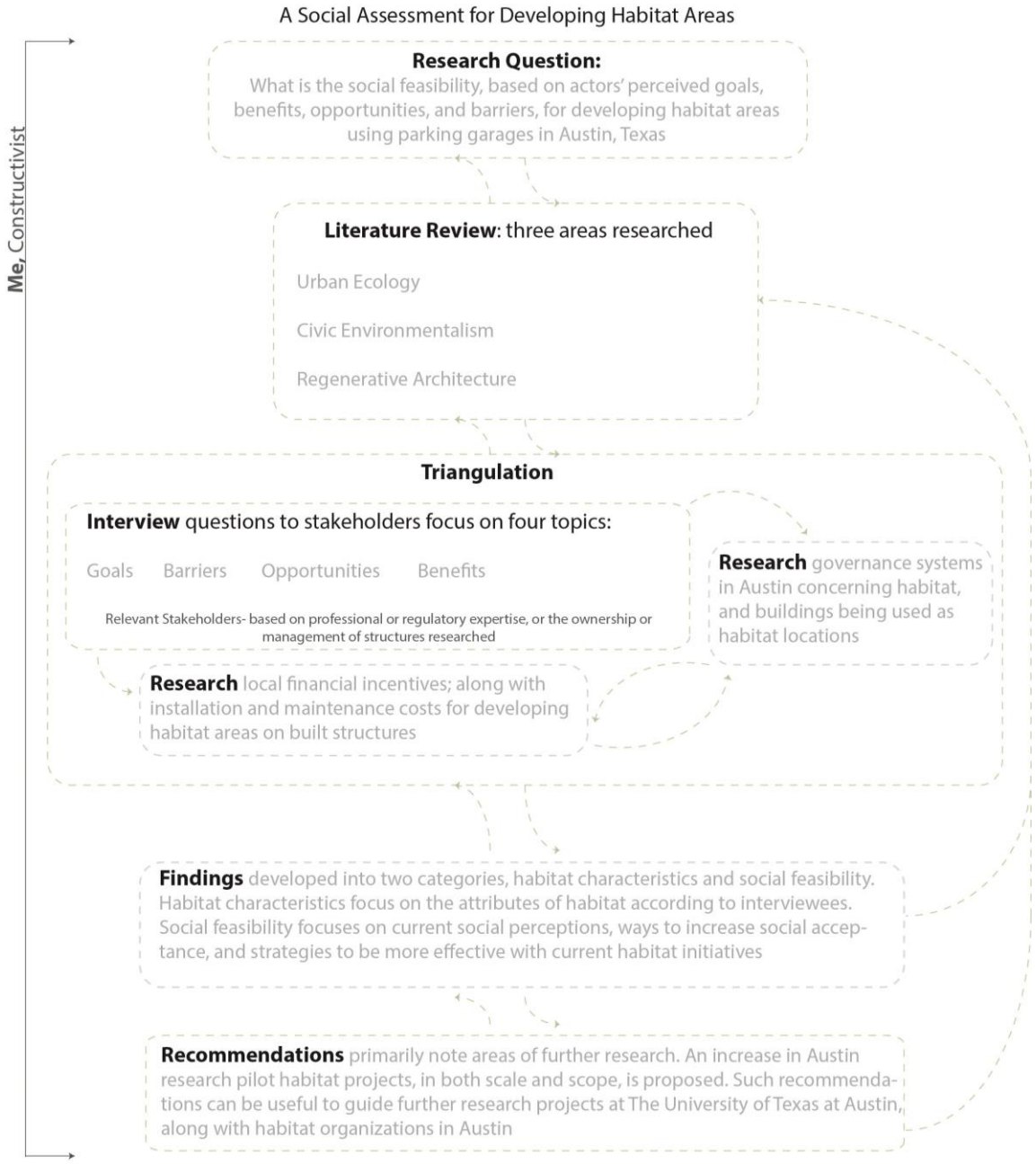

Figure 1: Research Design Map

METHODOLOGY

My study assesses the feasibility of using built structures, and parking garages, as habitat spaces based on stakeholders' perceived goals, opportunities, benefits, and barriers, in Austin, Texas. This is a social feasibility assessment of stakeholders with professional, or regulatory expertise on habitat development. A third group, consisting of individuals with property management or ownership authority, is also included. This research is undertaken using a constructivist epistemological framework, which recognizes the importance of individuals' constructed realities. Interviews will be the method used to gain insight into respondents' constructed frameworks. Data gathered from interviews will then be situated within local governance structures, and used to guide additional research inquiries.

By implementing a constructivist approach, I hope to better understand the contextual frameworks influencing peoples' choices than would be provided through other research designs. In this pursuit the goal is to reveal socio-technical opportunities, or barriers, for developing habitat areas using built structures. This information can be beneficially in furthering habitat initiatives, along with identifying opportunities for applying habitat designs to built structures in Austin, Texas.

An impetus to my methodological stance stems from negative externalities experienced on habitat projects that did not consider social realities. A study of the Chicago Wilderness demonstrated the failure of actors to recognize key stakeholder

frameworks, which lead to social strains, and extraneous monetizable expenditures.[4] Rather than taking a top down approach, as was used in the Chicago study, performing a social feasibility assessment is a bottom up strategy that can be used to guide future habitat projects.

A constructivist epistemological approach analyzes reality as being composed of inter-subjective understandings, subjective knowledge, and material objects.[5] Humans are observers, participants, and agents who, "actively generate and transform the patterns through which they construct the realities that fit them[6]." Using the aforementioned assumptions, I aim to better understand the socially constructed realities influencing the research subjects. Within the constructivist paradigm I will be using a post-modernist framework. This approach conceives of inter-subjective understandings as unstable, and altering with interpretation[7]. When interpreting the subjective understandings of research subjects it is important that I, as the researcher, aim to minimize my personal bias. However, my own inter-subjective reality is ultimately inseparable from my ability to discern and interpret information.

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[4] Helford, R. M. (2000). Constructing Nature as Constructing Science: Expertise, Activist Science, and Public Conflict in the Chicago Wilderness. In P. H. Gobster & R. B. Hull (Authors), *Restoring nature: Perspectives from the social sciences and humanities* (pp. 119-142). Washington, D.C.: Island Press.

[5] Lupovici, A. (2009). Constructivist methods: A plea and manifesto for pluralism. *Review of International Studies, 35*(01), 195. doi: 10.1017/S0260210509008389

[6] Reich, K. (2009). Three Constructivism: Diversity of Approaches and Connections With Pragmatism. In L. A. Hickman & S. Neubert (Authors), *John Dewey between pragmatism and constructivism* (pp. 39-44). New York: Fordham University Press.

[7] Lupovici, A. (2009). Constructivist methods: A plea and manifesto for pluralism. *Review of International Studies, 35*(01), 195. doi: 10.1017/S0260210509008389

METHOD

The method of data collection comprises interviews and research. 'Local governance structures' are chosen based on their regulatory influences in building habitat projects, and 'cost' chosen for its highly influential nature in decision frameworks. Cost and governance topics were also subjects repeatedly mentioned by interviewees. Figure 2 diagrammatizes how interviews and research will contribute to understanding the social feasibility for developing habitat areas.

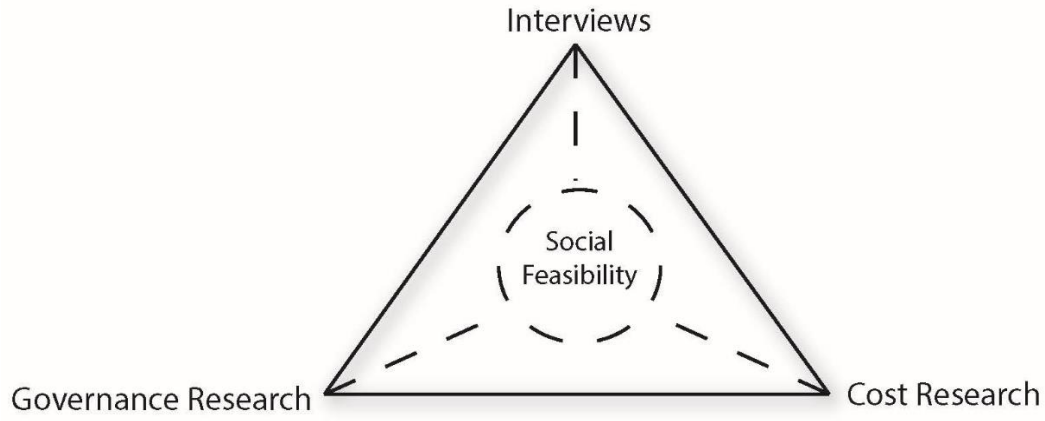

Figure 2: Triangulation of Research Design

Interviews are the primary component of this research, and are used to understand stakeholders' positions on the goals, opportunities, barriers, and benefits, for using built structures to develop habitats. Prior to interviews, respondents were told the term 'habitat' encompasses spaces for biotic organisms, not specific to plants or animals. Additionally, 'built structures,' or 'buildings,' were conveyed as urban places

constructed by people, inclusive of landscapes, and that the envelope of such systems was the focus of this study. A purposive sampling technique was used to select interview subjects based on their regulatory or professional expertise, or property authority. Table 1 outlines the different interview groups and subjects included in this research.

Interview Group	**Interview Subjects**			
Interested Organizations	National Wildlife Federation	Environmental Designer	Environmental Designer	Animal Services Employee
Pseudonym:	NWF	Lead ED	Fellow ED	Animal Services
Municipal	Parks and Recreation	Planning and Development Review Department	Watershed Protection	City Arborist
Pseudonym:	P&R	Land Developer	Watershed	Arborist
Property Owners/Managers	Parking Systems of America			
Pseudonym:	Parking Manager			

Table 1: Interview Subjects and Pseudonyms

Semi-structured interviews consisting of roughly 22 questions, and typically lasting between 30-45 minutes were conducted. A total of 9 interviewees participated, though additional subjects were sought. A lack in individuals willingness to participate, and time constraints, lead to the low numbers of interviewees.

The interview group 'Property Owners/Managers' includes members who are affiliated with managing parking garages. This group derived in part from interviews, and in part from previous knowledge of a proposed pilot habitat project. A green wall, designed by The Lady Bird Johnson Wildflower Center (LBJWFC) and The University of Texas at Austin, was recently proposed for a campus-parking garage. Parking garage structures also coincide with areas mentioned by interview respondents as spaces

suitable for habitat. The 'Austin Alliance' publishes a list of parking garage companies in downtown Austin[8], which was used as a source for gathering interview subjects. Interview protocols for each interview group are located in 'Appendix A.'

Interviews were recorded, transcribed, coded, and the codes used to develop themes. Transcriptions occurred at varying intervals, often two or more weeks after an interview. All interviews were conducted, transcribed, and coded by the same individual. In the process of developing themes, a coding method was used to link codes to instances within transcriptions. Figure-2 depicts an example of a code located within an interview transcription.

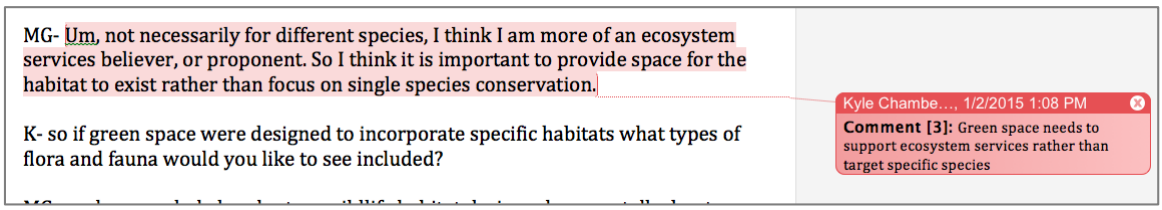

Figure 3: Example of Coding Process

Alphanumeric codes, such as 'MG_C3,' are used to identify the interview and code location. In the example, 'MG_C3,' the alpha charters- MG- represent a specific interview, in this case Parks and Recreation. The numeral character signifies the sequence of the code within the text. '3' represents the third comment, or code, within the transcription in ascending order. Alphanumeric codes are used throughout this

[8] Downtown Austin Alliance. "Parking." *Downtown Austin Alliance*. N.p., n.d. Web. 20 Apr. 2015.

report for referencing interview text evidence. The transcriptions containing each code can be made available by referencing 'Appendix B.'

After the preliminary coding process, all codes were re-transcribed on note cards and categorized into themes. Each interview group's codes and themes are kept within their separate groups.

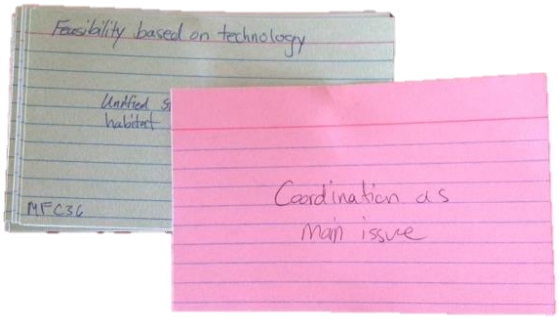

Figure 4: Example of Grouping Codes Into Themes

In Figure 4, the green note card includes codes taken directly from transcriptions, and the pink card represents meta-themes. As Figure 4 shows, the green card includes an alphanumeric code linking the card to a specific interview and code location. Green cards were grouped into themes, which were transcribed onto blue cards (not shown in Figure 4), and blue cards were grouped into larger meta-themes on pink cards. In total, 34 theme categories, and 11 meta-theme groups developed. Not all categories, or meta-groups are included in the report.

FINDINGS

Chapter 3: Findings Interested Organizations

Many of the questions asked to interviewees contained two parts. The first inquiry was answerable by a simple 'yes' or 'no' answer, followed by a question of 'why' a respondent chose their response. Respondents' answers to the 'why' questions provided code-able information that contributed to themes developed later in this section. However, the 'yes' or 'no' responses of interviewees are relevant for developing each respondent's viewpoint towards the themes discussed in this chapter. Table 2 provides the 'yes' or 'no' answers given by three of the respondents in the Interested Organizations group.

One respondent's answers, Animal Services, are not included in the table below, and are rarely mentioned in the themes section, Chapter 4. There are two reasons for this. One, because in route to the interview questionnaires were mixed up, and Animal Service was asked questions meant for the Municipal Group. However, this does not affect the comparability of responses among Animal Service and the rest of the Interested Organizations group. Questionnaires for all groups focus on goals, barriers, opportunities, and benefits, merely asked differently depending on the interview group. Secondly, the responses of Animal Service deviated from the typical responses given by other members, which made the information fit more appropriately in the 'Discussion' chapter of this report.

Table 2 Key: - = Negative association O = Neutral + =Positive association	**Respondent**		
Question	**Lead ED (MS)**	**Fellow ED (MB)**	**NWF (MF)**
Do you think green space in the city should aim at providing habitats for different species?	+	+	+
Do you think the City should pursue increasing the development of habitat areas, and networks in the city of Austin?	+	+	+
Do you think developing habitats should be goals of the City?	+	+	+
In your experience with the public, how do you envision their response to the idea of increasing plant and animal species within an urban area?	O	+	+
Do you think designing, and or retrofitting buildings to incorporate plant and animal habitats into their design are opportunities for increasing habitat areas within the city?	+	+	+
Do you think buildings can function as habitats, and in habitat networks?	+	+	+
Do you think urban landscapes designed as habitat areas can be used to develop habitat networks?	+	+	+

Table2: Interested Organizations' Base Answers

The majority of respondents in the Interested Organizations group answered favorably towards questions concerning habitat development, as noted in Table 2. These respondents believe buildings and landscapes are habitat opportunities, can operate in networks, and that Austin should be trying to develop habitat areas. Generally, interviewees' think the public will respond favorably to the development of habitat, though Lead ED does mention his viewpoint of the public's response as only, "moderately positive (MS_C17)."

Similar to the 'yes' or 'no' responses outlined in Table 2, questions relating to the type of species respondents would like to see more of in the city were straightforward answers. Species questions were followed by questions concerning the selection criteria behind a respondent's choice. The latter questions contributed to code development, while the former responses are include in Table 3. Two species choices, "trees" and "insects," are not included. These categories are deemed too broad, and therefore excluded from Table 3.

Table 3 Key: - = Negative association O = Neutral + =Positive association	Respondent			
Animal	**Lead ED (MS)**	**Fellow ED (MB)**	**NWF (MF)**	**Animal Services (AS)**
Grackle	- (C2)			
Hummingbirds	+ (C2)			
Prairie grasses	+ (C12)	+ (C6)		
Monarch Butterfly	+ (C19)		+ (C17)	
Honey Bees			+ (C17)	
Native Bees		+ (C6)	+ (C4)	
Raccoons		+ (C43.5)	O (C11)	- (C2)
Coyotes			O (C11)	O (C2)
Deer			-, O (C11)	O (C2)
Hawks			+ (C12)	
Owls			+ (C12)	
Song Birds		+ (C6)	+ (C12)	
Invertebrates		+ (C6)	+ (C12)	
Amphibians			+ (C12)	
Pollinators			+ (C12)	
Bobcats			O (C17)	
Ringtail Cats			O (C19)	
Foxes			O (C19)	
Butterflies		+ (C6)		
Bats		+ (C43.5)		
Possums				O (C2)
Skunks				O (C2)
Feral Hogs				O (C2)

Table 3: Animal Species Mentioned by Interested Organizations

Species are viewed both positively and negatively as shown in Table 3. The '-' mark is given for responses that used language, such as "unfortunate," to describe their presence in the urban area. If a respondent doesn't directly mention an organism in a negative manner, or if they are mentioned as migrants rather than residents of Austin, a 'o' mark is given. The '+' sign notes species thought beneficial, which song birds, invertebrates, native bees, monarch butterflies, and prairie grasses, are the most frequently mentioned.

Chapter 4: Themes Interested Organizations

The following section represents themes developed through coding the Interested Organizations interviews. The themes are split into two main topic areas, Habitat Characteristic and Social Feasibility.

HABITAT CHARACTERISTICS

Within the theme of habitat characteristics, interview responses primarily focus on three subject areas. Developing habitat is mentioned as contextually dependent, thought of in terms of systems, and environmental resiliency, are all topics mentioned by multiple respondents.

CONTEXT DEPENDENT

Habitat is mentioned as contextually dependent on a project's location. The dependent characteristics hinge on the geographical, and social interactions encompassing a place.

Discussions concerning geographical relationships focus on the connection among habitats, site advantages, and dense population centers. Habitat depends on, "proximity to existing habitat (MF_C8,)," "niches on the site that would produce good habitat (MF_C9)," and connecting habitat, or not "creating…island habitat (MF_C10)." The above quotations are all developed from the National Wildlife Federation (NWF) interviewee, but are similarly mentioned by other respondents (AS_C8, MB_C11). Animal Services also touches on the importance of scale in providing "beneficial" areas for wildlife (AS_C9). Likewise, the proximity of an urban center affects habitat type by

creating the, “wildest elements (MF_C52),” of habitat on the periphery, which become increasingly tame towards urban center (MF_C52). The above characteristics focus on developing connections among existing habitat locations, site niches, and scale. In addition to the biophysical elements of habitat locations, the social environment, or social microclimate, are included in geographical characteristics.

Respondents’ link species selection to habitat traits, and both relate to multiple microclimate elements. The type of habitat, or habitat network, chosen by respondents coincide with its perceived, “do-ability (MB_C9),” based on social receptivity and existing habitat formations, or patch locations, within an urban area (MB_C7). Most respondents’ believe it feasible to use buildings and landscapes to develop habitat networks, as mentioned in Table 2, but doing so depends on the target species and site “conditions (MS_C9, MF_C31).” Species and habitat types are conveyed as linked variables tied to the physical and social characteristics encompassing a space.

One respondent expounded on the social considerations of habitat development by outlining choices for habitat types relative to a project’s goals. Lead ED progressed the conversation of habitat beyond existing social characteristics, to future social desires. “It depends on what the ecological goal is. But yes, I think it is smart to actually engineer [green paces] towards specific performance goals, and that can therefore mean specific species (MS_C2).” Depending on a project’s goals a space, or habitat, will contain different species that help achieve the social desires.

The variability in habitat and species types, based on a project's context, are variables recognized among the Interested Organization respondents. Those dependencies relate to the biophysical and social relationships encompassing potential, and current habitat locations.

SYSTEMS FRAMEWORK

Most respondents view green space in terms of systems. This idea correlates to the context dependent topic in the previous section, but due to the specific mention of functionality as a system quality it's categorized on its own. Functionality relates to a wide spectrum of qualities from, "getting people to sit on vegetated material [to] just interact with it (MB_C2)," to life supporting systems (MS_C1). "Biodiversity [and] a mix of native plants to attract wildlife (MF_C1)," is included in the preliminary response of NWF concerning what green space is. The idea of plants attracting animals relates to a food chain system, which is mentioned by NWF later in the interview. Having, "healthy habitat diversity (MF_C13)," and considering, "the entire food chain (MF_C5)," in addition to key species, such as pollinators, is mentioned as critical. Green space is not viewed as an autonomous space but as a functional, life supporting system.

ENVIRONMENTAL RESILIENCE

Resilience, a topic brought up by multiple respondents, can be defined in a variety of ways. It can be the capacity of a system to adapt to changing conditions while

maintaining, or regaining, functionality in times of perturbation[9]. Additionally urban conditions affect biophysical elements, which in return effect the urban condition[10]. This relationship creates novel settings that drive environmental adaptation, ecological interactions, and thus influence a system's resilience.

In interviews respondents focus on biotic systems in Austin, and their ability to respond to long-range perturbations as result of climate change. Lead ED specifically mentions the need to design habitats that focus on, "long term resilience (MS_C6)," while Fellow ED discusses the necessity to, "look at the life cycles of target species (MB_C10)," to insure their survival. In framing resilience both respondents emphasize future long-range conditions for planning resilient habitats. NWF adds to this by highlighting, "future climate conditions (MF_C50)," as important for developing habit that will remain functional in the face of climate change. Another long-range trajectory in Austin is increased urban and suburban development.

Changing urban conditions will affect ecological interactions, and possibly provide new opportunities. Fellow ED views urban habitat as spaces for potentially displaced species. "Large green spaces," are mentioned as areas that, "can be held as refuges for different species (MB_C4)." This relates to an opportunity mentioned by NWF for using urban habitat to replace habit lost due to anthropogenic factors (MF_C7).

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[9] Resilient Design Institute. (2013, October 03). What is Resilience? Retrieved January 25, 2015, from http://www.resilientdesign.org/what-is-resilience/

[10] Alberti, Marina. "Eco-evolutionary Dynamics in an Urbanizing Planet." *Trends in Ecology and Evolution* (2014): n. pag. *Cell Press*. Web. 24 Mar. 2015.

In this way habitat is framed as an opportunity to create habit redundancy, and contribute to the resiliency of displaced species.

Resilience is outlined primarily as a way to prepare Austin's habitats for future climatic shifts. Though the driver of climate change is directly related to human activities, human dominated environments are also seen as potential sanctuaries in times of change.

SOCIAL FEASIBILITY

Four subjects occur within the Interested Organizations social feasibility theme. They are buy-in, perception, qualifications, and regulatory and technical drivers.

BUY-IN

Buy-in largely focuses on community infrastructure in Austin, and the public's role in habitat development. 'Buy-in' suggests that in order for initiatives, such as increasing habitat, to succeed it is necessary to develop public demand.

Community infrastructure focuses on Austinites, and whether the community is supportive of increasing habitat in the urban area. NWF spoke of how, "this town is in so many ways ripe for exactly what you are talking about I think (MF_C38)." Similarly, Fellow ED mentions how, "Austin does a lot of grass root things and it would be a good place to start, and really do this right (MB_C34)." And that, "Austin has it (MB_C16)," when referring to established community groups focused on urban habitat. Organizations are thought to be present in Austin, which aligns with the fact that the category of, 'Interested Organizations,' focuses on local groups dealing with habitat.

Though Austin is presented as a place "ripe" for pursuing habitat development, there is a perceived lack of public initiative to some. The public does not put enough stock in nature, due to their lack of understanding according to Lead ED (MS_C18). Incentivizing the public's demand for nature is largely viewed as the responsibility of the municipality (MS_C19), which is reiterated by Fellow ED in the need to, "get the government, the municipality behind [habitat development] (MB_C20)*."

Increasing the demand for habitat is considered crucial for its advancement. Fellow ED sees public participation as "the greatest part" of developing habitat for the awareness, and sense of ownership it fosters, leading to, "something that people demand (MB_C30, MB_C33)." In the interview, while discussing the challenges for developing landscaped habitat networks, Lead ED again brought up the idea of public buy-in, and how it represents a major hurdle. While Lead ED shared Fellow ED's sentiments, the former emphasizes the awareness component of developing habitat. According to Lead Ed "[the public] might not be aware that it's even possible (MSC12)," to use MOPAC for prairie habitat. Three of the four respondents frame developing awareness in the public as the driver for creating buy-in, viewed largely as a municipal responsibility (MS_C14_C12_C19, MF_C15, MB_C43_C33_C20).

* Multiple respondents mention possibilities for promoting biotic habitat that are addressed later in the Regulatory Drivers section

The community of Austin is seen as an area containing organizations, and a potentially receptive public for developing habitat areas. However, creating awareness and demand in the public sphere is still necessary.

PERCEPTION

Perception is integrally linked to education, and focuses on changing social habitat viewpoints. The topic concentrates on reframing peoples' understanding towards the pallet of plants used in landscaping, as well as the relationship of urban dwellers to biotic systems. NWF contrasts the perception some neighborhood associations have with what "looks messy (MF_C24)," to beneficial habitat development. Similarly, she relates the importance of "Educat[ing] people…that it is ok to have plants close together, kind of shrubby and thickety, it's a good thing for wildlife (MF_C45)." Fellow Ed thinks opportunities exist to change the typical pallet of urban plants towards supporting richer habitat, which is contingent on public perception (MB_C26). Developing new outlooks towards habitat creation, or "landscaping sustainably (MF_C2)" as NWF put it, relates to the exposure level and knowledge base of participants, ultimately education.

Education plays a key role in changing social perceptions towards landscaping, along with nurturing new relationships among people and their environment. NWF mentions that more education is needed to get, "people to understand the benefits of doing this sort of thing (MF_C45)," in reference to habitat creation. In addition to altering urbanites' understandings towards the benefits incurred by landscapes, Fellow

ED thinks reframing an individual's place within the ecosystem is necessary. People, "think we are kind of separate from it all…but if we think of ourselves as part of it, I think it helps (MB_C24)."Education holds a prominent role in the perceptual changes thought necessary to produce a social framework supportive of habitat landscapes, that's inclusive of ecosystem thinking.

QUALIFICATIONS

Understanding how to develop and maintain habitats are thought to be lacking by current practitioners. This sentiment is voiced by both ED respondents, and directed towards design, construction, and maintenance professionals. Fellow ED focuses on how there are a few niche companies that can, "take on these more complicated landscapes," that, "a lot of maintenance crews do not know how to handle (MB_C40)." The complication in complex habitat areas arise from maintenance crews not knowing, "what species are good, what aren't, how they should water, [and] mow (MB_C40)," which reveals a knowledge gap in the typical maintenance profession. Lead ED mentions the lack of knowledge in the entire construction process, "from design, implementation, construction, oversight, and maintenance (MS_C16_C26)." Both Lead and Fellow ED work in the designing and implementing of habitats for buildings and landscapes. Their comments shed light on the possibility of a lack in skilled labor able to handle complex habitat projects.

REGULATORY DRIVERS

Cost is a primary barrier for developing habitats according to multiple respondents. Concerns over cost are fairly expected, but the method for remedying the barrier is interesting. Rather than perceiving cost barriers as directly related to technologies for developing habitat, respondents emphasize the need to create municipal incentives. Lead ED mentions how green roofs are typically viewed as an added expense, but "what we need to do there is have incentives from the city (MS_C22)." Fellow ED also remarks on the success of cities such as Philadelphia, Pennsylvania with green infrastructure through a storm water fee (MB_C19). A tax, or voluntary fund option, to sustain an organization for maintaining, and developing habitats is mentioned (MB_C36_C38_C39). Additionally, creating "something written that [is] more about green space… [because] it's not super well represented (MB_C32)," are ways mentioned to incentivize habitat development. Respondents view City incentives as the means to overcome cost challenges.

COORDINATION ISSUES

A reoccurring theme is the need for a better communication network for developing habitats. This network covered three main subject areas concerning parcels, developers, and property owners. NWF emphasizes the need for a, "unified strategy (MF_C36)," among groups who work with habitat to pursue its increased development in a, "logical and methodic way (MF_36)." Trying to, "connect those dots," of where open spaces are, is something NWF thinks numerous nonprofits, conservation groups,

or green space programs in Austin could rally behind (MF_C18). Communication among developers, from design to maintenance, is needed. A common problem is, “the right hand [not] talking to the left hand (MF_C51),” for how to maintain or install a habitat project as stated by NWF, and Fellow ED (MB_C42). To have owners’ commit property to specific habitat types is also indicated as a coordination issue, though ‘buy-in’ is certainly a component (MF_C42_C44_C49, MB_C31). Developing a strategy for where the best habitat locations are, how to develop and maintain them, as well as for uniting disparate property owners and organizations, are all coordination challenges for establishing habitat.

Chapter 5: Findings Municipal Group

As with the Interested Organizations group, many questions asked to municipal interviewees contain ‘yes’ or ‘no’ responses, followed by more in depth explanations. Table 4 relates responses for two municipal group interviewees, and Table 5, the remaining two. The reason for splitting up responses is that two interviewees were given questionnaires intended for the ‘Interested Organizations’ group. The number and types of questions differ slightly between the two questionnaires, but there the material difference is minimal. As previously mentioned, all questionnaires focus on goals, benefits, barriers, and opportunities, making the information gained in interviews comparable among respondents.

Table 4 Key: - = Negative association O = Neutral + =Positive association	**Respondent**	
Question	**Watershed**	**Parks & Recreation**
Do you think green space in the city should aim at providing habitats for different species?	+ (C4)	+ (C3)
Do you think the City should pursue increasing the development of Habitat areas in the city of Austin?	+ (C11)	+ (C11)
Do you think the city should pursue increasing the development of habitat networks?	+ (C22)	+ (C13)
Do you think the idea of developing habitat areas, and networks should be goals of the city?	+ (C29)	+ (C16)
Has your organization ever pursued an idea similar to developing habitat networks?	+ (C34)	- (C19)
Do you think designing and or retrofitting buildings to incorporate plant and animal habitats into their design are opportunities for increasing habitat areas within the city?	+ (C55)	+ (C29)
Do you buildings can function as habitat networks?	+ (C62)	+ (C46)
Do you think urban landscapes designed as habitat areas can be used to develop habitat networks?	+ (C63)	+ (C47)

Table 4: Watershed's and Parks & Recreation's Answers to Questions

As shown in Table 4, both Watershed and P&R support using built space, and green space for habitat expansion. The, '-', mark under P&R simply means, according to her, parks and recreation has not pursued ideas similar to developing habitat networks. It does not indicate a lack of support for such initiatives. Located in Table 5 are the responses of Arborist and Land Officer, who received the Interested Organizations questionnaire.

Table 5 Key: - = Negative association O = Neutral association + =Positive association	Respondent	
Question	**Arborist**	**Land Officer**
Do you think the city of Austin should be working to increase green space?	+ (C2)	+ (C1)
Do you think increasing green space can help achieve the goals you mentioned as important for the city?	+ (C8-12)	+ (C6)
Do you think green space in Austin should be used to re-wild the city?	+ (C13)	+ (C7)
Do you think it is important to re-wild urban places?	+ (C15)	+ (C9)
Would re-wilding contribute to the goals you see as important for the City?	+ (C17)	+ (C11)
Do you think designing habitat networks to provide connectivity through the city is something Austin should pursue?	+ (C29)	O (C17)
Do you think designing, and or retrofitting buildings in a way that incorporates plant and animal habitats into their design, presents an opportunity for developing habitats, and habitat networks in Austin?	+ (C31)	+ (C21)
Do you think designing, and or retrofitting landscapes in a way that incorporates plant and animal habitat into their design, present opportunities for developing habitats, and habitat networks in Austin?	+ (C33)	+ (C29)
If buildings were designed to incorporate habitats, and combined into networks, would you consider this as beneficial for the City?	+ (C36-37)	+ (C30)
If landscapes were designed to incorporate habitats, and combined into networks, would you consider this as beneficial for the City?	+ (C39)	+ (C33)

Table 5: Arborist's and Land Officer's Answers to Questions

The 'o' mark under Land Officer indicates a response not wholly fore, or against the question asked. Land Officer is unsure if networked habitat systems are, "core

purpose[s] of a city (MD_C19).” However, providing a “park system” is considered a core service, and is thought of as a potential habitat space (DM_C3).

Table 6 Key: - = Negative association O = Neutral association +=Positive association	**Respondent**			
Animal	**Arborist**	**Watershed**	**Parks & Recreation**	**Land Officer**
Red Tailed Hawks				+ (C13)
Bees		+ (C13)		
Oaks	O (C23)			
Elms	O (C23)			
Ash Juniper	O (C23)			
Chinese Tallow			- (C6)	
Native Bees		+ (C13)	+ (C8)	
Deer			- (C26)	
Coyotes			- (C26)	
Snakes		- (C53)	- (C26)	
Spiders			- **(C26)**	
Rats		- (C53)		
Raccoons			+ (C27)	
Hummingbirds			+ (C27)	
Fox			+ (C27)	
Monarch Butterfly			+ (C54)	
Opossum		- (C27)		

Table 6: Species Mentioned by Municipal Respondents in All Interviews

The ‘-’ marks under Watershed and P&R in Table 6 do not concern their personal views on those particular species. Rather, both respondents mention the checked species in discussions concerning the public’s response to the species type. Chinese

Tallow is the only exception, which P&R mentions as an invasive pest species. The ‘o’ marks under Arborist represent tree types that are in excess of what Arborist perceives to be a balance in urban tree populations.

Chapter 6: Themes for Municipal Group

The following sections are themes developed from coding the Municipal Group interviews. Three metathemes- Habitat Characteristics, Challenges, and Social Feasibility-are used to categorize sub-themes.

HABITAT CHARACTERISTICS

Respondents of the Municipal group brought up three primary themes focused on habitat quality. They are goals and functions, native and adaptive plants, and connections, which all frame habitat as a system that performs.

GOALS & FUNCTIONS

Habitat is intended to accomplish specific objectives, as stated by Land Officer and Arborist. Land Officer's species selection criterion focuses on solving "mosquito," or nuisance species problems by, "supporting and sustaining bat habitat (DM_C14)." This exemplifies Land Officer's thoughts on how species should be selected, based on their provision of a service. Land Officer reiterated the goal-oriented approach mentioning that once, "health, safety, and welfare," issues are accounted for it's about, "trying to figure out what you are trying to do (DM_C36)." Orienting habitat to accomplish tasks directly relates to both broad, and specific functional qualities mentioned by respondents.

Parks and Recreation (P&R) referred to herself as an "ecosystems services believer," who thinks it important to, "provide space for habitat to exist rather than focus on single species (MG_C13)." In providing habitat it should include "structural

diversity (MG_C9)," that supports a range of organisms. P&R's framework aligns with a systems approach to habitat considerate of trophic hierarchies. A similar sentiment is voiced by Land Officer who mentions the "different [functional] levels" green space can provide, and its ability to "actually regenerate (DM_C7)." P&R and Land Officer broach the idea of sustainable habitat that provides a regenerative, or additive benefit to an area.

Arborist and Land Officer focus on storm water management as an influential criterion in habitat selection. Habitat is, "heavily seeded towards storm water (ME_C35)" in Austin, and largely accounts for what is considered "environmentally sensitive features." Though Land Officer does not explicitly state storm water management as the environmentally sensitive feature criterion, examples given such as, "steep slopes, soils, aquifers, streams, flood plains," support the notion that "sensitive features" focus on storm water management (DM_C12_C15).

Municipal respondents present habitat as a service infrastructure system. Services range from fodder for animal hierarchies, to more typical urban practices, such as storm water management. Whatever the service, habitat is primarily understood as accomplishing specific goals.

NATIVE & ADAPTIVE

A service, or function-oriented model for choices concerning habitat and species is apparent in interviews. Organisms most respondents believe to provide the most

function are native, or adaptive species that are, “mother nature tested (ME_C13),” as Arborist phrased it.

Terms such as, “resilient, durable, hardy, low water, and drought tolerant (MH_C8_C9, MG_C5),” are used to describe the environmental specific qualities native, or adaptive organisms possess. Traits of native species that have evolved to Austin make them, “suited for our landscape (MG_C5).” Arborist went beyond native or adaptive species to describe what he termed, “truly native or adaptive,” which encompass native seed sources (ME_C28). Native seed sources are explained as beneficial because, “genetically [they are] prepared for the conditions that are in this region.” Red oaks, which range from Texas to West Virginia, are used as an example of how seed sources can vary. Red oaks from the east coast are explained as less suited for Texas than Texas seeded red oaks (ME_C28.5).

The terms native, and adaptive are conveyed as fairly interchangeable in interviews. The primary focus is on species that exhibit traits preferable to specific goals, typically surrounding drought tolerance for Austin.

CONNECTION

Connections among habitat areas are discussed as creating value, but not necessarily practiced considerations. Multiple respondents, such as Arborist, mention contiguous habitat as providing increased benefit with time (ME_C6_C31). Similarly, connecting ecosystems is important in conservation and protection according to Watershed, but fragmentary practices are often not reflected upon in development

decisions (MH_C25_C23). Land Officer more closely aligns with development in that habitat connection is not considered a City 'core service,' which are primary municipal responsibilities (DM_C18). However, core systems such as "parks," are links considered important, and opportunities mentioned for habitat (DM_C2_C4). Connecting biotic urban habitat is thought useful, but not always considered in decisions.

Part of creating better connection is interfacing biological and built components. Developing "wildscapes" for, "humans and native plants and animals," to freely interact is important to P&R, and regular contact with such spaces is crucial to both P&R and Arbotrist (MG_C1_C2). Buildings are mentioned as often the only available space in urban environments to nurture interactions among people and wildlife (MG_C31). "Interfacing," rather than "colliding" built components with "natural systems," can develop urban places that stimulate a connection to habitat, and provide diverse utility (MH_C26_C59_C14). Transforming "complicated" human systems, which "can snap at any one or two" linkages, to mimic natural systems, which are "redundant" and "interact synergistically" (MH_C38)," is what Watershed thinks urban environments should strive for. To do this involves gaining public acceptance on the importance of incorporating habitat into built systems (MH_C1_C4).

CHALLENGES

Three primary topics are relayed as challenges for incorporating biotic habitat into the urban environment. Monetary concerns are principal, but coordination among organizations, and a lack in ecosystem education are also hurdles presented.

COSTS

Costs are mentioned as the leading barrier for entities to begin developing habitat among three of four interviewees. Financial barriers are rooted in affordability concerns, and in "competing [fund] priorities" (MG_C13). Social desires are often conflicting, as mentioned by Land Officer, who cites a study of Austinites and their top two desires, "High quality schools, and…low taxes (DM_C19)." The desire for a high quality public service, education, conflicts with the public's willingness to pay. On the opposite spectrum, some individuals are not able to pay. Affordability concerns over developing habitat are framed as potential barriers in an already stressed Austin housing market (MH_C42, DM_C31). Concerns over cost can even apply to neighborhood improvements, which P&R says can generate negative public reaction over the often increase in property taxes that follow (MG_C22).

Cost considerations are also thought to be major concerns for developers. Habitats cost money, which equate to losses in profit for builders (MG_C58). However, the assumed loss of profit is only thought prevalent in short run considerations. In the long run, "we are going to be paying for…this incredibly destructive, energy sapping [form of development], but you know when you are just counting things, and looking at money you just focus on the things you can count, not…intangible [things] like habitat (DM_C8, MH_C78)."

COORDINATION

Coordination, or communication, among municipal and private entities is needed to encourage habitat development. "You have to have the maintenance and the crew work, you have to have the professionals work to design the thing adequately, and you have to have government play a positive role…so all of these things have to work well enough to make this [idea] work (MH_C68)". There is a perceived institutional "rivalry" among landscape architects and engineers that creates poor communication among professions (MH_C67_C70_C71_C72). Increasing coordination among professionals only addresses a fraction of the needed communication equation however. Property owners are the other variable. Garnering agreement, and commitment among dissimilar owners represents a major barrier (MG_C57, DM_C35). Competing understandings and interests from diverse actors pose as significant logistical hurdles to habitat development.

EDUCATION

Education on the importance, and opportunity, for incorporating habitat into urban design is a prominent barrier second only to cost concerns for some respondents. Land Officer mentions, "perception…or education level," as one of three main challenges for encouraging habitat (DM_C23). The other two are regulation, and cost concerns. In order to change regulations however, Watershed believes, "you start with education (MH_C17.5)." Individuals such as landowners, builders, and upcoming professionals, are mentioned by P&R as important figures to teach about habitat design,

and influence development. Specifically, The University of Texas at Austin architecture students are mentioned as being, “sort of new to wildlife habitat design.” P&R goes on to suggest the potential for an, “architecture ecology,” course that introduces, “why you would want to incorporate [wildlife habitat] more into your design (MG_C45_C48).”

Human-wildlife conflict is another area thought to improve with greater education on ecosystems, and their benefit in the urban environment. Owners’ confliction with species centers on their, “rights [as] property owners (ME_C16),” and perception of, “nuisance [species]… eating up everybody’s nice shrubs and bushes and landscaping (DM_C10).” This leads to the, “good wild life and bad wildlife,” concept discussed by P&R and Watershed (MG_C27). Both view a certain amount of “mistrust” in the public towards wild creatures, “and wild looking landscapes (MH_C53, MG_C27).” This mistrust leads Watershed to believe the public’s response to increasing habitat to be, “incredibly mixed (MH_C49).”

SOCIAL FEASIBILITY

Education influences social considerations, and is a theme respondents’ think necessary for habitat development. Creating public buy-in, changing the appeal of landscape types, and creating cultural acceptance, are goals to further habitat proliferation. Creating a social and physical environment inclusive of habitat centers around pilot projects that produce educational, and functional value.

BUY-IN

Watershed is the lead in discussing social buy-in. Crafting structures that incorporate habitat is not sufficient, “you have to have public buy in, you have to have people get it (MH_C31).” Producing buy-in is born from people “experimenting” with ideas and, “getting excited about…all of the possibility,” rather than looking at government mandates or incentives as, “big mean government (MH_C60).” It is about “recognizing how important [ecosystem services are] for [peoples] wellbeing and survival (MH_C30).” Climate change is viewed as a potential driver for increasing peoples recognition of habitat value, and buy-in. “I think as things change, climate changes, and it gets 10 degrees hotter…some people are going to freak out, and just lash out, and want to cling to what we have right now, and then…hopefully, [a] gradually enlarging group of people go, we are going to have to figure this out, we are going to have to be more resilient somehow (MH_C36).” As the climate becomes more variable Watershed hopes the public looks at ecosystem design as something, “where people are like, I have got to do this, of course you do this…at some point we are realizing that we need to look a lot more like permaculture (MH_C30).”

PERCEPTION

What is idealized in society influences the type of habitat pursued. Arborist discusses the lack of “understory trees… because they are not as visually appealing at the nursery (ME_C24),” and that people want trees that will look like a, “picturesque live oak (ME_C26).” The public’s expectations on how foliage is ‘supposed’ to look can

sway tree diversity, and the possibility of habitat reaching, “climax conditions (MH_C52).” As habitat areas mature they progress through a growing phase that is aesthetically undesirable to some according to Watershed (MH_C52). People, “love manicured green grass…that is what they grew up with, and that is sort of the American dream for them (MG_C24).” To produce urban spaces with increased habitat function often will require a shift in how some understand biotic beauty.

CULTURE

The culture, or acceptance, of using buildings and landscapes for habitat areas are perceived among respondents differently. Arborist believes the culture to be good (ME_C33), while Watershed thinks responses would be incredibly mixed (MH_C49). Watershed goes on developing the lack of ecosystem considerations as a strongly American trait (MH_C14). The cultural, “crisis is not, do we have the right laws in place, or what have you, but we don’t have the education and we don’t have the understanding. It’s almost more of a spiritual crisis than it is a regulatory problem (MH_C27).” The “crisis” pertains to people realizing the value of habitat, and sculpting a society that exhibits those values through design. P&R focuses the discussion on culture at the neighborhood scale, referencing homeowner associations and the effect they have on local habitat. “Some [HOAs] are completely on board...it really takes committed volunteers in that area (MG_C40).” Having strong neighborhood habitat advocates is mentioned as make a substantive difference in neighborhood habitat development, and acceptance (MG_C40).

PILOT PROJECTS

All respondents emphasize the need for functioning preliminary projects integrating biotic elements into built, and landscaped structures. Land Officer mentions the need of, “more examples,” that decrease the perceived financial risk (DM_C24.5). The conversation surrounding pilot projects not only focuses on their need, but also on them demonstrating value and working properly. Value, as Watershed mentions, can be social and or ecological (MH_C32). However, without a project demonstrating value, and functioning properly, respondents as a whole think example projects ultimately would hurt the habitat cause (MG_C39, MH_C68_C69, ME_C7). To avoid this, Watershed mentions the need for, “adaptive management (MH_C43),” strategies. Pilot projects are seen as a vessel to develop greater social acceptance, but only if done correctly, especially in initial undertakings.

Chapter 7: Findings Parking Garage Owners and Managers

The Parking Garage Owners and Managers group was decided upon after completing interviews with the Municipal, and Interested Organizations stakeholders. Interview questions posed to these two groups were intentionally left broad to see if patterns emerged concerning structures, or landscapes they thought suitable for habitat development. The most prevalent spaces mentioned helped guide the selection of the third interview group. Table-6 lists potential habitat areas mentioned by respondents in the Municipal, and Interested Organizations groups. The single structure mentioned most by interviewees is parking garages. Alleys and sidewalks, if combined with right-of-ways, which they are, would however be the most mentioned.

Right-of-ways are not used to base the third interview group off of for a variety of reasons though. Primarily, right-of-ways are too broad of an interview subject field. Additionally, a driver for this research stemmed from a stalled green wall project on a campus-parking garage at the University of Texas at Austin. Since the stalled project dealt with parking garages, and parking garages are the most mentioned structures in interviews, owners and managers of parking garages compose the third interview group.

Table 7	
Structures Mentioned by Municipal & Interested Organization Groups	**Interview Reference**
Parking Garages	DM_C25, MG_C46
Alleys	ME_C20
Sidewalks	MG_C48
Right-of-Ways	ME_C20
Community Gardens	MG_C19
Libraries	MG_C33
Seaholm Eco. District	MG_C33
Hospitals	MG_C50
Parks	MG_C60
Schools	MF_C26
Condos	MF_C29

Table 7: Structures for Habitat According to Municipal and Interested Organizations

Finding owners or managers willing to participate in interviews proved to be difficult however. A map of parking areas produced by the Austin Alliance lists garages and lots in Austin's downtown, which was used to pool interview subjects from. A total of eleven parking organizations, encompassing both public and private entities, were contacted several times. Two additional organizations (BOMA and RECA) dealing with property development and management were also contacted. Only one parking manager was willing to participate in an interview.

Three focus areas comprise the dominant themes discussed in the Parking Manager interview. They are aesthetic appeal, cost barrier, and parking garage opportunities.

AESTHETIC APPEAL

By far the most ubiquitous characteristic, or benefit, of habitat for Parking Manager is aesthetic appeal. Multiple times in the interview habitat areas are described as, “all for the look (PM_C11).” He mentions providing more colorful plants downtown as “aesthetically” being “like night and day” compared to what is there (PM_C16). “Using plants to cover up exterior water leaks and rust” on parking garages, along with replacing exterior signage, are all considered potential uses of habitat to increase downtown aesthetics (PM_C10).

Though the inclusion of vegetation is primarily focused on providing a more visually pleasing downtown area, the visual appeal is thought to have a marketing potential. Currently, “everybody wants their parking structure to be littered with signs (PM_C11).” Using green walls as a type of signage for, “way finding (PM_C17),” or branding, is mentioned as a potential for habitat that also provides beautification to the downtown area.

COST BARRIER

Cost again is a primary hurdle for establishing habitats on parking garages. In the parking industry they are always looking to eliminate costs, according to Parking Manger, and when doing something new the first questions are going to be, how much will it cost, and how much will it cost to maintain (PM_C14). Cost is the primary reason he believes, knowing his client, developing habitats on their garage would be unlikely (PM_C21). Though the, “month to month,” maintenance fees are relatively low for

parking garage upkeep, adding vegetation, “is going to be another line item in the budget (PM_C31),” absorbing profits. Additionally, the perceived costs are higher for habitat incorporation due to it being a novel addition to a parking structure. The unknown of, “what if something goes wrong,” and venturing into uncharted territory are seen to, “… all go back to cost (PM_C30).” To convince an entity to, “take that chance,” is considered, “to be the biggest challenge (PM_C29),” even over budgetary constraints.

PARKING GARAGES AS OPPORTUNITIES

Parking garages with vegetated habitat are considered an opportunity according to Parking Manager. There is mentioned to be, “plenty of spots…where we have dead space on the exterior (PM_C18).” However, incorporating vegetation into existing structures is thought difficult since, “it’s not a normal situation- so in the budget and planning- it’s just not even thought of (PM_C13).” However, he thinks the real opportunity for habitat garages is in new apartment developments (PM_C23.5).” Parking Manager focuses on residential garages for the benefits residents gain with increased contact to vegetation, along with the ability to use the area above the garage for developing habitat (grounds above residential parking structures often exist for outdoor use, as is the case for the interviewees garages) (PM_C23_C33). Residential properties are also preferable due to the influence residents have on property owners because, “[resident] feedback is always number one. I would say it really starts there (PM_C33).” ‘Starting’ refers to getting vegetation on parking structures (PM_C25). “If

[including habitat on parking structures] is seen in an established community like this one…maybe [it'll] start a trend with new development (PM_C26_C25)."

RESEARCH OF GOVERNANCE AND COST STRUCTURES

Chapter 8: Regulation and Cost Research

The previous 'Findings' chapter developed directly from comments made by interviewees. Through speaking with respondents, stakeholders revealed their understanding of various topics concerning the incorporation of habitats onto built structures. This chapter looks at the regulatory arena, its effect on habitat in the built environment, along with the costs associated with building-habitat technologies- focusing specifically on green roofs. Current regulations are the body of this chapter, however, with special emphasis on the city of Austin's Green Roof Advisory Group (GRAG).

Research into the regulatory environment of Austin, specific to landscapes and buildings as habitat, largely developed from regulations expressed by respondents. If, as with Animal Services, a respondent had a strong opinion concerning the efforts of Austin's municipality towards developing habitat areas, but did not express explicit regulations, their sentiment is included within this chapter. Both sentiments and expressed regulations are included together because a respondent's opinion, concerning the municipality's efforts, pertains to the regulatory body of the city.

The cost of habitat technologies focuses on green roofs. This technology has received a wide range of support in Austin, making it more likely to find cost on than other nonexistent habitat-building technologies. This does however leave a large gap concerning building habitat designs, specifically in reference to green walls. However,

few green walls that aim to develop complex habitats have been conduct in Austin at this point in time.

The lack of green wall projects in Austin, and the municipality's focus on green roofs, makes comparing green roofs through the purview of costs, regulations, and their social acceptance, more relevant than other building habitat forms. This is why green roofs are the focal point of the regulation and cost discussion.

REGULATIONS AND SUPPORTING PROGRAMS

Respondents' discussed a slew of regulations, and programs, present within Austin supporting the development of habitat. The mentioned support systems largely pertain to landscapes, but some address habitat on buildings- primarily focusing on green roofs. Programs brought up in interviews are listed in Table 8. The National Wildlife Federation (NWF) interviewee is the primary contributor to the list below. The last four programs are exceptions, which members of the Municipal Group introduced.

Table 8	
Program	**Brief description of program**
Backyard Wildlife Habitat Certification	A certification program through the National Wildlife Federation that focuses on gardening for wildlife. The certification requires a landscape provide food and water sources, cover, a place for rearing an animals offspring, and a healthy habitat, which focus on limited for no use of chemicals, and native plantings. (NWF website)
Eco-Schools Program	A program through the National Wildlife Federation (NWF) originally developed by the Foundation for Environmental Education (FEE). Eco-Schools uses "green" management of the school grounds, the facilities and the curriculum; in order to provide students with a unique, research and application based learning experience. (NWF website)

Table 8: List of Municipal Programs Discussed in Interviews

Austin's Habitat Stewards Program	Austin Parks and Recreation, in conjunction with the NWF, trains people to create native wildscapes at their homes and public places, along with training to teach and assist others. (City of Austin Website: Parks and Recreation)
Texas Wildscapes Program	Texas Wildscapes is a habitat restoration and conservation plan for rural and urban areas developed through Texas Parks and Wildlife. It enables Texans to contribute to wildlife conservation by developing wildlife habitats where they live, work and play. (Texas Parks and Wildlife website)
Texas Master Naturalist	The program, developed through the Texas Parks and Wildlife and Texas A&M Agrilife, is to develop a corps of well-informed volunteers to provide education, outreach, and service dedicated to the beneficial management of natural resources and natural areas within their communities. (Texas Master Naturalist website)
Hill Country Conservancy	An organization that works in the greater Austin area to preserve the natural beauty, fertile soil, wildlife, and history of strategic tracts of open space. (Hill Country Conservancy website)
Green Alley Initiative	A program through Austin's office of Sustainability that aims to transform alleys around Austin into community areas equipped with green infrastructure systems. Providing space for wildlife is included within this initiative. (City of Austin's website: Sustainability)
City of Austin Wild Lands	A program through the city of Austin that preserves outlying spaces for species conservation, and areas critical to aquifer recharge. The Balcones Canyonlands Preserve (BCP), and the Water Quality Protection Lands (WQPL) are included within this program. (City of Austin's website: Austin Water)
Balcones Canyon lands Preserve	Included within the City of Austin's Wild Land program, and is a preserve set up for the protection of endangered, and threatened species (City of Austin's website: Austin Water)
Grow Green Program	Grow Green is a gardening education program that promotes sustainable landscaping practices. It addresses water quality and conservation, recycling, and an Integrated Pest Management philosophy, which encourages the least-toxic way to address pest issues. (City of Austin's website: Watershed Protection)

Table 8: Continued

All of the above mentioned initiatives deal with habitat, and most mention the integration of wildlife within the urban context as part of the program's goals. Certain initiatives, such as the city of Austin's Wildlands program, deal more with outlying areas around the city proper, but still demonstrate the abundance of programs promoting habitat in and around the city. A common theme of programs listed in Table 8 is enlisting Austinites to increase the presence of habitat spaces, along with educating the public on habitat friendly landscaping. Looking for novel opportunities to implement habitat designs, such as alleys, are additional components to many of the mentioned initiatives. With there appearing to be ample programs fostering the proliferation of habitat in Austin, a question of regulatory support arises.

Multiple respondents discuss the issue of landscaping regulations. Ordinances restricting grass height, as mentioned by NWF (NWF_C21), are seen as barriers to habitat development. However, members of the municipal group were aware of this barrier, and of the code ratification aimed at addressing it thorough 'alternative compliance,' and 'affirmative defense.' As mentioned by Arborist (ME_C45), and other members of the municipal group, property owners can submit an alternative compliance request, or file an affirmative defense, allowing lawn grass to exceed the 12" maximum height according to code[11]. Alternative compliance also keys on Low

[11] USA. Code of Ordinances. *Code of Ordinances*. By City of Austin. Austin: n.p., n.d. Print. Chapter 10-5-miscellaneous public health regulations; Section 21-duty to maintain property in a sanitary condition

Impact Design (LID) strategies, while striving to increase and preserve native on site vegetation[12].

Code changes encouraging LID align with the recent comprehensive plan produced by the City. As Land Developer notes, in 2009 the Imagine Austin Comprehensive Plan was introduced, and contains a 'priority program' focusing on green infrastructure. Within this program green infrastructure is mentioned as providing numerous socio-environmental benefits, including enhancing ecosystems and habitat[13].

Around the time of Imagine Austin's release an advisor group was formed to research the applicability of green roofs. The Green Roof Advisor Group (GRAG) was established in 2009 as a multi-departmental group aimed at advancing green roofs through research, incentive programs, and education[14]. GRAG worked extensively with Watershed Protection, Austin Energy Green Building, and the Austin Climate Protection Program; while also gathering input from other experts, including The Lady Bird Johnson Wildflower Center (LBJWFC). The LBJWFC was involved in green roof research, and contributed to the development of best practice green roof design guidelines currently being used by the City.

Beginning in 2010, GRAG outlined a 5-year plan to establish a green roof development framework for Austin. A major component of this plan was to, "unify

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[12] USA. Austin Code of Ordinances. *Austin Environmental Criteria-2.5.0*. By City of Austin. Austin: n.p., n.d. Print.

[13] City of Austin. "Priority Programs: Use Green Infrastructure to Protect Environmentally Sensitive Areas and Integrate Nature Into the City." *Imagine Austin Comprehensive Plan* (2009): 186-97

[14] Green Roof Advisory Group. *Report to Austin City Council*. Rep. Austin: n.p., October, 2010.

green roof policy across City departments[15].” Policy incentives, such as including green roofs in the ‘Down Town Density Bonus Program,’ were recommended to city council, and many were adopted to code. Continuous public education was another important component in the GRAG program.

“Outreach and Education” are highlighted sections in the breakdown of milestones to be accomplished in the GRAG 2010-2015 plan. Part of education and outreach is to establish an online presence. In 2011 a city website was launched, “to encourage the building of green roofs in Austin[16].” This website was to contain local case study information, and a continuously updated map of green roof locations around the City. Green roofs in Austin, such as City Hall, are recommended for use as, “educational tools.” As a whole, a “proactive effort for the City,” as mentioned in the 2011 GRAG report, “would be to categorize all city-owned roofs with the intent to study, select and seek additional funds for appropriate green roof locations[17].”

Retrofit opportunities are also considered in GRAG reports. GRoWERS, a then 4-year old Austin green roof organization, had been working in the realm of small scale, private, green roof developments and retrofits. This organization is discussed as a potential GRAG partner in their drive to encourage green roof development.

The policies and programs GRAG sought to implement were largely based off other municipal green roof initiatives. GRAG researched green roof programs in cities

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[15] Green Roof Advisory Group. *Report to Austin City Council*. Rep. Austin: n.p., October, 2010. Print

[16] Green Roof Advisory Group. *Green Roof Advisory Group: Report to Austin City Council September 2010.* Rep. Austin: n.p., 2010. Web. Appendix D. Policy and Incentives Matrix (pg.27)

[17] Footnote 15

such as Chicago, Portland, and Toronto, using them as successful green roof policy examples. In their investigation it was concluded that green roof policy follows a 6-phase process. It begins with "Introduction and awareness," and proceeds through, " community engagement, action plan development and implementation, technical research, program and policy development, and continuous improvement." Austin was thought to be in phase three, "action plan development and implementation," and GRAG was working to progress Austin through the latter phases of green roof development[18]. GRAG was only a temporary advisory group, however, and was disbanded after its 2-year period.

Departmental municipal programs and regulations appear to be fairly conducive to habitat in Austin. This aligns with interviewees' perceptions of the City's efforts to create habitat spaces. As mentioned in the 'Findings' section, Animal Services felt particularly strong about this point, which is why I include their opinion in this section rather than in the Findings.

The primary theme in Animal Services' interview is that the City has created plenty of habitat spaces. In asking the respondent whether Austin should be working to increase green space they said, "probably not (AS_C4)." Habitat is thought to be abundant, and connected due to City initiatives that work to purchase environmentally sensitive areas, including riparian and flood zones (AS_C10, C17, C21, C24). "Just in and around Austin and Travis County they have about 80,000 acres of mitigation property,

[18] Green Roof Advisory Group. *Report to Austin City Council*. Rep. Austin: n.p., October, 2010. Print

and preserved property (AS_C4).” Though the respondent’s tone is critical of municipal habitat spaces, it is mentioned as an overall beneficial practice. Animal Services feels the City will, “continue to buy property, and…expand on all of this stuff…and it’s a good thing (AS_C25).”

The respondent’s main qualm with Austin’s habitat initiatives are their “preservation” rather than “conservation” mentality. “Most of their properties are high fenced, no public access to a lot of it, it’s total shut down preserve. There is nothing, there is no fire breaks- or are very few fire breaks, it’s a preserve (AS_C27).” The respondent believes Austin should change their habitat practices from “preservation” towards “conservation,” which is primarily characterized by increasing public access to, and use of spaces. Though Animal Services has some issue with the method for maintaining habitat, they do bring up the point that the city of Austin has worked, and is still working, to secure habitat acreage.

The Imagine Austin Comprehensive Plan confirms the notion of the City continuing to develop green space. Figure 5 and Figure 6 are taken from the plan, and outline current and future open spaces in Austin.

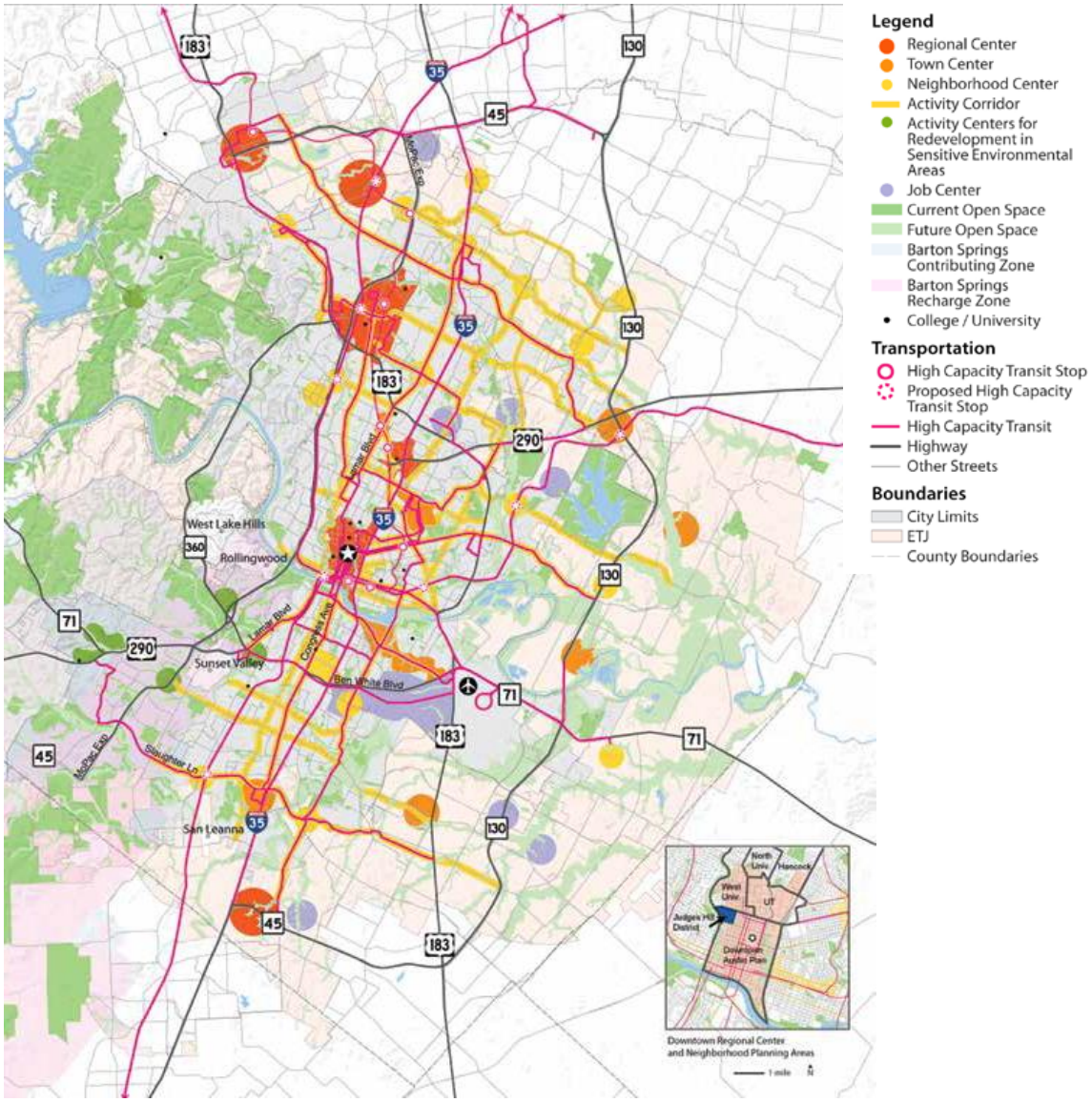

Figure 5: Growth Concept Map[19]

[19] USA. Planning Department. Austin Comprehensive Plan. By City of Austin. Austin: n.p., 2009.

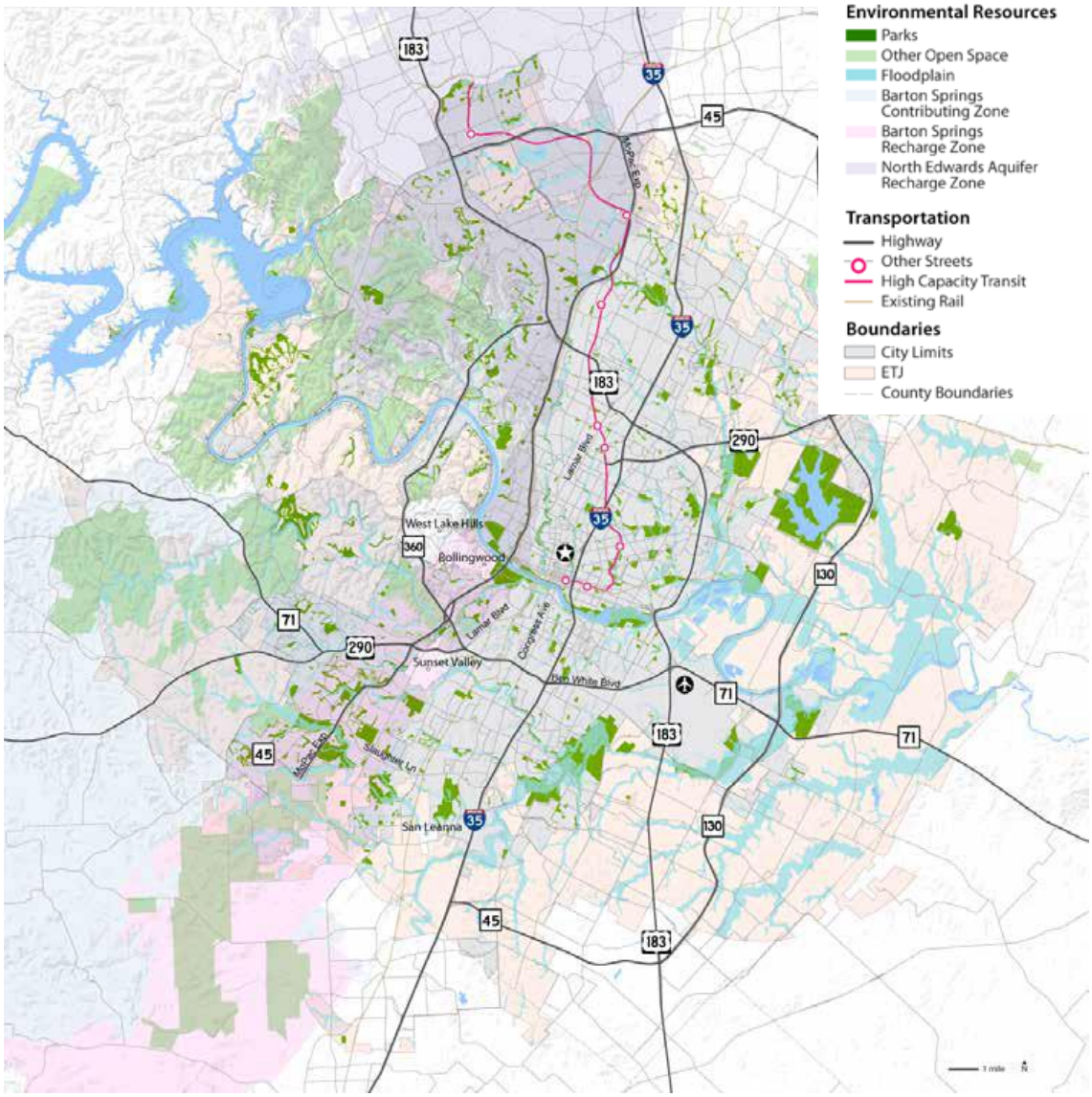

Figure 6: Environmentally Sensitive Areas[20]

In the maps above, current and future open spaces include,

Parks, greenways, nature preserves, agricultural land, and environmentally sensitive land. Areas within floodplains, on steep slopes, or with significant environmental features, such as sinkholes, caves, or significant wildlife habitat, are classified as environmentally sensitive[21].

[20] USA. Planning Department. Austin Comprehensive Plan. By City of Austin. Austin: n.p., 2009.

[21] USA. Planning Department. Austin Comprehensive Plan. By City of Austin. Austin: pg. 108, 2009

If municipal agencies are working towards the goals of the Imagine Austin Plan, it is understandable when Parks and Recreation says, “The City is the largest landowner in Austin,” and is a key stakeholder for developing habitat areas (MG_C57).

COST

The cost of developing habitat is a common theme throughout interviews, and each group mentions cost as a primary barrier. The two principal themes of ‘cost’ relate to financial incentives, and the hard costs surrounding habitat technologies (refer to the ‘Findings’ section for supporting respondent dialogue). This section will look at both the availability of incentive programs, and try to understand the associated hard cost, which are installation and maintenance expenses, for developing habitat spaces.

Many of the respondents are municipal employees and discuss a variety of programs from Love Your Block Grants, to Adopt a Park programs that support increasing habitat in the City. However, since this research focuses on using parking garages as places for habitat, financial programs that promote a building-habitat interface will be focused on. The green roof support system developed in the GRAG years is a progenitor to Austin’s building-habitat program.

In the GRAG’s recommendations to City Council a section is included on “Financial Incentives”. These incentives took the form of rebate programs, tax credits,

grants, and low interest loans[22]. Table 9 lists all of the financial incentives included in the GRAG report with some columns exempted in-order to save space.

Table 9	**Description of Current Status/Concern**	**Potential Improvement**	**Advantages**
Subsidies, Grants, Low-interest Loans	City does not provide any funding for green roofs	Chicago, Montreal, Toronto, & cities in Germany & Switzerland provide some form of funding for green roofs. Portland Provides up to $5 per sq ft for green roofs that provide stormwater management as part of their Grey to Green initiative	Further incentivize green roofs.
Development Process Initiatives (Fee Rebates, Expedited Process, Design Support)	City does not provide development process incentives for green roofs	Provide development process incentives (fee rebates, expedited process, design support) for green roofs. Chicago & Washington D.C. offer expedited review & permit process. Chicago also provides a dedicated review team and fee waiver.	Further incentivize green roofs.
Local Improvement Credits	City does not provide local improvement credits (municipality offers loans for upfront Improvement costs and is reimbursed through property taxes over time) for green roofs	Provide local improvement credits for green roofs. Similar to City of Austin program currently proposed for solar panels	Further incentivize green roofs. Shift cost of green roof off of developer and onto owner (who is receiving long-term benefit-e.g. energy savings).

Table 9: Proposed GRAG Financial Incentives

[22] Green Roof Advisory Group. *Green Roof Advisory Group: Report to Austin City Council September 2010*. Rep. Austin: n.p., 2010. Web. Appendix D. Policy and Incentives Matrix (pg.27)

Property Tax Credit	City does not provide property tax credits for green roofs	Provide property tax credits for green roofs. New York City offers a one-year property tax credit of up to $100,000.	Further incentivize green roofs.

Table 9: Continued

Financial incentives differ from policy incentives in that they represent a direct monetary exchange between the City and the incentive recipient. Each program listed in Table 9 is modeled off other municipal green roof programs GRAG thought successful.

Though the financial incentives included in the GRAG report were considered successful green roof policy in other cities, they are not included in Austin's city policy. On the City's website a document titled, 'The Existing Credits for Green Roof Projects in Austin', it does not mention any of the financial incentives recommended in the 2010 GRAG report. On the website below the link to the existing credits document it states, "there are currently no existing rebates or price reductions for green roofs." None of the financial incentives recommended in the 2010 GRAG report were adopted by City Council.

Austin's policy programs often have financial drivers, like cost savings from energy reductions, but these do not relieve initial cost burdens. The financial initiatives outlined in the GRAG report help address initial cost barriers, but were never made available.

The next areas of 'cost' to address are those incurred in installing and maintaining habitat features. With policy programs in place to spur green roof

development, it seems reasonable to assume that baseline data concerning project installation, and maintenance costs, would be easily accessible. However, this is not the case.

The Lady Bird Johnson Wildflower Center (LBJWFC) is known for green roof research, and contributed to the GRAG reports. After contacting their environmental design team inquiring into green roof installation and maintenance costs, I was told the data was not available. Another organization mentioned in interviews, Southern Botanical, specializes in maintaining complex landscapes, such as Blackland prairie habitat. This organization was also unable to provide cost data. Without obtaining cost information from organizations that develop habitat areas, I went back to the City's website to look for more information.

The City's green roof website lacks maintenance and installation cost data, but it does include information on local green roof case studies. Efforts were made to contact the owners of listed green roof projects to obtain data, but were unsuccessful.

The unavailability of cost information does not mean contracting or landscaping firms aren't available to provide green roof installation or maintenance quotes. It does reveal an accessibility barrier to information concerning the costs of green roofs specific to Austin's climate. A possible reason for the barrier is the variability of costs depending on a project's size and scope. However, a cost information barrier can hinder the ability of individuals to propose green roof projects. Increasing the ease of access to cost data has the potential to decrease the perceptual risk of green roofs, potentially leading to

their increased production.

CONCLUDING REMARKS

Chapter 9: Discussion

According to respondents there does appear to be support in Austin for developing habitat infrastructure using buildings and landscapes. However, interviewees primarily composed municipal employees, or members of organizations that work in habitat related fields. Of the 13 parking garage stakeholders contacted, only 1 was willing to participate in an interview. This shows a very real barrier in even beginning a dialogue with parking garage owners or managers. It potentially indicates that, although parking garages are mentioned as potential structures for habitat, perhaps other assemblies stated in interviews, such as libraries, schools, or municipal properties, offer more viable opportunities for habitat development.

In questioning the possibilities for habitat infrastructure in Austin, interviewees revealed loose guidelines relating to the function of habitat areas, and their potential as a tool for driving social change. It was revealed that even in a location such as Austin, which has a record of furthering habitat initiatives, there still exist social barriers inhibiting its evolution.

The qualities of habitat projects need to align within a functionalist paradigm. Function can be defined in a variety of ways, as both Environmental Designers mention, and needs to be specific to the ecological context of an area, and to the goals of a project. Native and adaptive species are overwhelmingly preferred. Though the term ‘adaptive’ is somewhat elusive, the characteristics of preferred species rests in drought

tolerance, and increasing resilience. These two traits are primary drivers in selecting species suitable to Austin's current, and future conditions. Additionally, a functionalist approach requires being cognizant of the interplay among ecosystems.

Recognizing the connection among habitats is vital for creating sustainable spaces. For example, birds and pollinators are the primary species respondents' mention for inclusion in habitat development. Incorporating vital food hierarchies are necessary for creating functional habitats, as noted by multiple respondents. Though these species are typically aviators, and less constrained by landscape breaks, the importance of connectivity does not diminish. The forging distances of all species has limits, and insuring connection among habitat areas develops a more resilient, life supporting infrastructure system.

Creating spaces measured by function and resilience can often require atypical metrics for success. It is vital that the goals of a project not only be clear, as Lead ED emphasizes, but that clear methods for measuring their achievement also be developed. This applies to qualitative goals, such as the enjoyment of green space, along with quantitative figures, like energy or cost accounts. In this way, a habitat project will produce data that can be reintegrated in an iterative learning process of improving infrastructure systems, and as tools to drive social change.

Areas from education, to the implementation of habitat projects need increased data to help steer decisions. A first step in this process is understanding the type of information that will most effectively improve habitat infrastructure. Better

coordination among habitat organizations is outlined as having the potential to improve the current communication gap. By synchronizing common goals among disparate entities, a more strategic habitat front can develop. This also increases the potential scale of habitat projects, which expands the benefits provided to species as mentioned by respondents. Synthesizing common goals among groups, while re-communicating this information to organizations, is an area in need of improved data collection.

Improving habitat information can help improve decisions, and provide opportunities for educational outreach- a gatekeeper of social demand. A primary component in the educational category is the unfamiliarity of design students with wildlife strategies, along with the lack of trained professionals. Incorporating methods on devising, collecting, and using the collected data in curriculums, are ways to educate participants on habitat design, while teaching evidence based decision strategies. Both factors create familiarity among professionals to habitat concepts, and influence social perception. Another main component in education focuses on increasing the public's exposer to, and buy in for, habitat projects.

The Green Alley Initiative is a program mentioned by respondents that can influence communities, and future practitioners in habitat concepts. Expanding these types of initiatives in quantity, scope, and scale, offer opportunities for increasing public exposure to habitat-building integration. Through evaluating such projects critically, data can be gathered and reincorporated into educational programs, or used for developing baseline information, such as for maintenance and installation costs. This

process helps build a case for habitat design, while influencing public perception, and buy-in.

At the municipal level efforts have been pursued to increase habitat through programs like GRAG, or the establishment of Affirmative Defense, but not maintained. In the GRAG reports public education, coordination among municipal departments, and financial supports, are all areas addressed that align with respondents perceived barriers. It is now the final year of the GRAG's five-year plan, and many of the preliminary strides to address education and financial support structures have waned, or were never enacted. Retrofitting and studying municipal green roofs does not appear to have occurred, some organizations mentioned in reports are no longer active, and the interactive web map showing green roofs in the City is out of date, and contains less green roofs compared to the 2011 GRAG map. Additionally, the financial incentives outlined in 2011 were not enacted by City Council.

The publics' interest in green roofs, and their willingness to pressure City Council seems to be missing. This is corroborated by the lack of parking garage owners willing to have a conversation about interfacing habitats with parking garages. To sway public opinion, and increase demand, respondents generally point towards education as the solution. It is possible that the GRAG's assumption in 2010 of Austin being in phase-3, "action plan development and implementation," of green roof advancement was incorrect. Perhaps Austin is still in phase-1 or 2, "introduction and awareness," or "community engagement." To increase awareness, visible pilot projects that rigorously

compile data, and include a variety of participants in their development, study, and maintenance, need to be produced. A component of research that seems intuitive, but missing, is the primary barrier mentioned by respondents, cost data. Pilot projects need to incorporate cost studies into their analyses, and make the data publicly available so it can be used to spur social change.

Chapter 10: Conclusion

To continue understanding how built systems would incorporate habitat into their design, multiple areas would benefit from research. Possible opportunities for further investigation are listed below.

Research framing habitat as food production - In interviews 'habitat' was left very general, but focusing on its potential for food production could yield interesting results. In Austin, and the U.S., urban farming is a growing movement, which the Municipality has devoted a section of its website to. The current social trend, coupled with municipal support, might reveal a public more receptive to a discussion than the Parking Garage Owners/Managers group did in this study.

Research into an organization for increasing coordination – Coordination among habitat organizations is seen as lacking, and researching what the framework of an organization aimed at bridging this gap might look like is area in need of research.

Research structures other than parking garages for habitat locations – Multiple locations, such as libraries, schools, and public facilities, were mentioned by respondents as potential places to build habitat into structures. Research the feasibility of these structures for incorporating habitat.

Research the costs incurred in habitat development – Cost is perceived as the primary barrier to habitat development. Researching the actual costs for interfacing habitats with buildings, in Austin, is needed.

Research educational programs – Researching how/if habitats are focused on in the curriculums of professionals in the design, installation, and maintenance of habitat projects.

Using current habitat projects to develop data – Using current projects that develop habitat to gather data on costs, successes, failures, and opportunities.

Identify Neighborhoods without habitat advocates – Neighborhoods with active habitat volunteers are mentioned as having a significant impact to habitat development. Identifying neighborhoods that currently lack a habitat type organization could show potential areas for establishing one.

Residential Apartment Garages- Research the potential of residential apartment garages as habitat areas.

Cost Incentives- Research alternative cost incentive programs than the ones sent to City Council by the GRAG, and research the reasons why the GRAG's were not adopted.

Lastly, we need more examples exposing individuals to urban habitat projects to increase social awareness, and to develop data from. The building-habitat interfaces discussed in this paper largely focus on green roofs, however, other opportunities do exist. An exterior green wall project for a parking garage at the University of Texas at Austin has been proposed. This project offers a perfect opportunity to increase exposure, education, and to develop data from. As a leading academic institution The

University of Texas at Austin should not pass up the opportunity to showcase the potential of buildings to operate as green infrastructure systems.

LIMITATIONS

Some limitations of this study are its low interview numbers, my personal bias in data analysis, and the choice of interview stakeholder groups. This study only interviewed 9 actors of the original 20 sought for data analysis. In analyzing interview transcriptions, my personal bias is an unalienable factor, and the themes I extract are based off my interpretation. The potential for developing different themes with alternative data analyzers exists. Finally, though I chose stakeholders based on their professional or regulatory expertise, other criteria, or group combinations are possible, and potentially would yield different results.

APPENDICES

Appendix: A

Interview prompts for each interview group are included in this Appendix A.

Questions for: Municipal Group	Questions	Sub-questions	Aim of Question
Goals	How do you define urban green space? Do you think the city of Austin should be working to increase green space? Why or why not?	What are some primary goals you think the city should be working towards? Do you think increasing green space can help achieve the goals you mentioned? Re-wilding is a term that is used to discuss providing, and expanding the numbers of, plant and animal species into urban places. Do you think green spaces in Austin should be used to re-wild the city? Do you think it is important to re-wild urban places? Can you explain why or why not? Would re-wilding contribute to goals you see as important for the City?	To try and understand if green spaces, and increasing plant/animal habitats, would contribute to goals the respondent thinks are important for the City

Goals	What types of habitats do you want developed in Austin? What (or which) selection criteria for the habitat types would you prioritize? What types of species do you want to see more of in Austin? Can you provide me with the selection criteria for the species you would prioritize? What specific criteria are important in your consideration for prioritizing sites and species?	Connectivity among habitat areas is often integral to certain species. Do you think designing habitat networks to provide connectivity through the City is something Austin should pursue? Why or why not?	1) See what type of species the respondent would like to see in the city, and the reason behind choosing the species they did. 2) Understand the respondent's viewpoint on having habitat networks in the City
Opportunity	Do you think designing, and retrofitting buildings in a way that incorporates plant and animal habitats into their design, presents an opportunity for developing habitats, and habitat networks in Austin? Why or Why not? *Repeat question but phrased for landscapes instead of buildings	Are there opportunities for developing habitat networks that you think Austin has yet to explore? If yes, what are they?	Introduce the idea of the buildings' providing habitat locations, and being joined in networks, to see if the respondent think's it is a viable opportunity.
Benefits	If buildings were designed to incorporate habitats, and combined into networks, would you consider this as beneficial to the City? In what way? *Repeat question but phrased for landscapes instead of buildings	What do you see as the specific issues associated with implementing buildings as habitat areas?	Understand the respondent's viewpoint concerning the benefits (or shortcomings) of habitats, and habitat networks

Barriers	What are the most significant challenges for incorporating habitats into a building's design here in Austin? For connecting habitats into a networked system using buildings? *Repeat question but phrase for landscapes instead of buildings	Ask about codes, private property issues (maintenance and decisions over plant types), costs, technologies for retrofitting, third party oversight	To understand where the greatest barriers in designing/retrofitting buildings as habitat areas are

Questions For: Property Owner/Manager Group	Questions	Sub-question	Aim of Question
Goals	How do you define urban green space? Do you think Austin should be working to increase green space within the city? Why or why not?	What are the top three goals you think the City should be working towards? Does increasing green space help achieve these goals? Re-wilding is a term used to discuss increasing the presence of plant and animal life in urban places. Do you think trying to bring more animal and plant species into the city is important? If so, in what way? Would this help achieve some of the previous goals you stated? How?	To try and understand: 1) If respondent thinks Austin needs more green space and 2) What they hope to accomplish by having more green space 3) If increasing plant and animal life in the city achieves the goals they see as important
Goals	What types of flora and fauna would you like to see more of in the City?	Why did you select those particular types of biota? What specific selection criteria are important in your consideration	To understand what types of species the respondent would like to see in the city, and their reasoning behind their species choices

		of prioritizing biota? Do you think green spaces in the City should work to provide habitats for species you mentioned?	
Goal/Opportunity	Connectivity among habitat areas is often integral to certain species. Do you think designing habitat networks to provide connectivity through the City is something Austin should pursue? Why or why not?	Do you think there are opportunities for developing habitat areas on your property? If so, what are they? What are opportunities your neighborhood (or the neighborhood in which the property lies) could pursue? If your property were part of a habitat network, what type of habitat network would you like it to be? Why or why would you not want to be part of a network?	To see if habitat networks are something the respondent thinks are worthwhile, and where opportunities for developing such networks are
Opportunities	Do you think buildings (or parking garages and lots) can be designed to provide habitat for biota?	Do you think retrofitting your building to incorporate habitats is feasible? Do you think retrofitting your landscape to incorporate habitats is feasible? Would you be willing to do it? Why or why not?	To see if the respondent thinks buildings could be used to develop habitat areas/networks in the city, and retrofit potentials
Benefits	If your building (parking garage) were designed to incorporate specific habitats for biota,	Who benefits? The larger community of people, or animal life? If only the landscapes	To see how the respondent perceives retrofitting/designing buildings with habitat areas, and who such

	would you see this as beneficial? Why or why not?	around your building were designed and included in a habitat network, would you see this as beneficial? Who are the greatest recipients of benefits? Why?	practices would benefit
Barriers	What are the most significant challenges you see for developing, or retrofitting, your building to provide habitat spaces? For including it in a habitat network?	Inquire into possible challenges dealing with: Private property; management and maintenance of space; city building code; compliance and insurance issues.	aunderstand the hurdles for using buildings as habitat locations in the City

Questions for: Interested Organizations	Question	Sub-question	Aim of Questions
Goal	What is your definition of urban green space? Do you think green space in the city should aim at providing habitats for different species? Why or why not?	If green spaces were designed to incorporate specific habitat types, what types of flora and fauna would you like to see included? Why did you select those particular species? What are important specific selection criteria to consider when designing habitats?	Understand what species the respondent thinks should be brought into the City, and why
Goal	Do you think the City should pursue increasing the development of habitat areas? Why or Why not?	What about habitat networks? Why or why not? Do you think the previously mentioned ideas should be goals for the City?	To understand if the respondent thinks developing habitat areas should be goals of the City
Opportunities	What role might public involvement have in planning for, selecting,	Has your organization ever pursued an idea similar to developing	To understand how the respondent perceives the publics' interest,

	and designing habitats, and habitat networks?	habitat networks? If so, what did you learn? What were some major issues? In your experience with the public, how do you envision their response to increasing plant and animal species within the urban area?	and role in developing habitat areas
Opportunities	Do you think designing, and or retrofitting, buildings to incorporate plant and animal habitats into their design are opportunities for increasing habitat areas in the city? Can you identify any specific opportunities that might facilitate the use of buildings as habitat areas? Can you identify any specific opportunities that might facilitate the development of landscapes designed to increase habitat areas?	Do you think buildings can function as habitat areas, and in habitat networks? Do you think urban landscapes can be designed as habitat areas, can used to develop habitat networks?	To introduce the concept of buildings as spaces for habitat development, and understand respondent's views towards such an idea
Barriers	What are the most significant challenges for developing, or retrofitting, buildings to provide specific habitats? *Rephrase question using landscapes instead of buildings	What are significant challenges for buildings being designed for, and included in habitat networks? (Private property? Management and maintenance of space? City Code? Willingness of public? Compliance? Neighborhood plans? Downtown development zones?)	Understand what barriers the respondent thinks exist for using buildings as habitat areas in the City

Appendix: B

Interview transcriptions are available up request by contacting the individuals below…

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